SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRMNagar, Kattankulathur 603203

DEPARTMENT OF MECHANICAL ENGINEERING

B.E MECHANICAL ENGINEERING

Question Bank

Regulations -2019

Academic Year 2022-23

VII SEMESTER

1909702 PROCESS PLANNING AND COST ESTIMATION

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DEPARTMENT OF MECHANICAL ENGINEERING

QUESTION BANK

SUBJECT / SUBJECT CODE : PROCESS PLANNING AND COST ESTIMATION / 1909702
SEM/YEAR : VII/ IV

UNIT – I INTRODUCTION TO PROCESS PLANNING

Introduction- methods of process planning-Drawing interpretation- Material evaluation– steps in Process selection-.Production equipment and tooling selection.

PART-A (2 Marks)

Q.No	Questions	BT Level	Competence
1.	Identify the process planning activities.	BT-1	Remembering
2.	Select the process parameters for setting machines and toolings.	BT-3	Applying
3.	Summarize the factors influencing process selection.	BT-2	Understanding
4.	List the advantages of Standardization	BT-2	Understanding
5.	Define process planning.	BT-1	Remembering
6.	Summarize the use of drawings interpretation.	BT-2	Understanding
7.	Quote the each component of the product in the process sheet.	BT-1	Remembering
8.	Define batch production.	BT-1	Remembering
9.	Compare mass and batch production.	BT-2	Understanding
10.	What is meant by reliability of the product?	BT-2	Understanding
11.	Define tolerance.	BT-1	Remembering
12.	List the use of process Sheet.	BT-1	Remembering
13.	Prioritize the sort of information can the process planner obtained from the engineering drawing of the component.	BT-1	Remembering
14.	Give a procedure for process planning for the manufacture of a Component in machine shop.	BT-2	Understanding
15.	List the objectives of process planning.	BT-1	Remembering
16.	Discuss the various parameters considered in the material selection?	BT-2	Understanding
17.	Quote the steps involved in process design.	BT-1	Remembering

18.	Discover the work holding Devices and why they are used.	BT-3	Applying
19.	Point out the main inputs and outputs for process planning activity.	BT-4	Analyzing
20.	Originate the advantages and disadvantages of process planning.	BT-1	Remembering
21.	Assume a process flow chart and how would it be used to help formulate a process plan.	BT-4	Analyzing
22	Justify the importance of process planner to have a good knowledge of materials used in manufacturing?	BT-5	Evaluating
23	Categorize the main approaches of process planning.	BT-4	Analyzing
24	Compose the documents required for Process Planning?	BT-1	Remembering
25	Illustrate the factors considered for selection of machines and tooling's.	BT-1	Remembering

PART-B (13Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Identify the steps involved in Process Design and also examine the basic factors affecting Process Design.	13	BT-1	Remembering
2.	Explain the technological frame work of process planning by using a block diagram.	13	BT-4	Analyzing
3.	Explain the procedure involved in the product design with suitable flowchart.	13	BT-1	Remembering
4.	Devise with neat sketch and the steps followed for material selection process and methods.	13	BT-4	Analyzing
5.	Show the two approaches to Process Planning in the context of CAPP (Computer Aided Process Planning)? Explain them clearly.	13	BT-1	Remembering
6.	Explain briefly the factors considered for selection of Equipments for process planning?	13	BT-1	Remembering
7.	Describe the various factors which govern the selection of a manufacturing process.	13	BT-2	Understanding
8.	(a) Discuss the various parameters considered in the material selection. b) Summarize the documents required for Process Planning?	7 6	BT-2	Understanding

9.	(a) Classify the four distinct processing strategies. b) Summarize the process layout with neat sketch.	7 6	BT-2	Understanding
10.	(a) Describe the steps involved in Process Planning. (b) Show the data is listed for each component of the product in the process sheet.	7 6	BT-3	Applying
11.	Identify and describe at least five types of geometrical tolerances.	13	BT-1	Remembering
12.	Generalize the factors that affect tooling performance.	13	BT-6	Creating
13.	Summarize the factors are taken into consideration in Process Selection.	13	BT-2	Understanding
14.	Explain with neat sketch and the steps followed for machine selection.	13	BT-5	Evaluating
15.	Describe the various properties' of engineering materials	13	BT-4	Analyzing
16.	Priorities the constraints that must be considered in tool selection	13	BT-5	Evaluating
17.	Analyze briefly about the tooling for machinability.	13	BT-4	Analyzing
18.	Illustrate the three analyses that can be carried out during drawing interpretation.	13	BT-1	Remembering

PART-C (15 Marks)

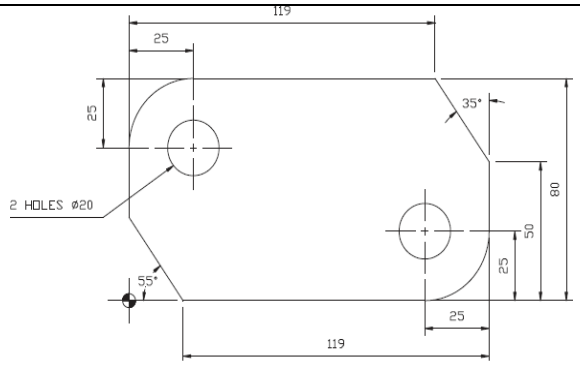
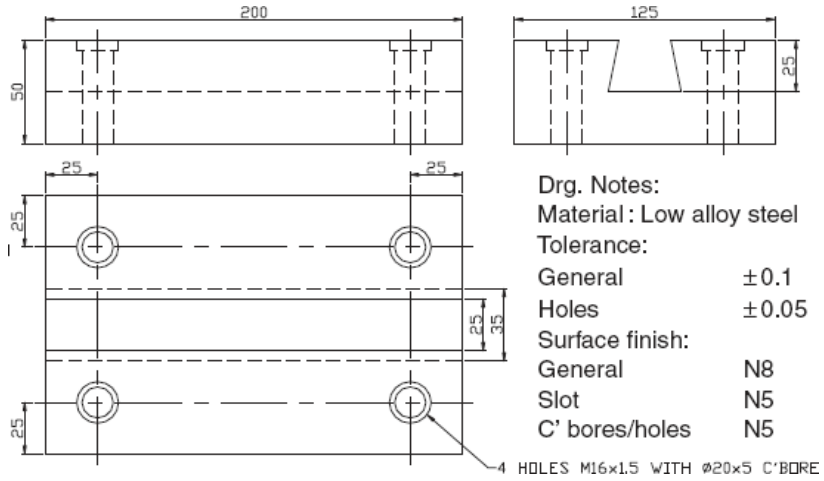
Q.No	Questions	Marks	BT Level	Competence
1	Plan the steps involved in calculation of man-hours and machine-hours availability.	15	BT-5	Evaluating
2	Reframe the main inputs and outputs for process planning activity?	15	BT-5	Evaluating
3	Write the advantages and disadvantages of manual process planning and also list the general guidelines for process planning.	15	BT-6	Creating
4	Develop the industrial engineering functions that contribute to the Process planning activity.	15	BT-6	Creating
5	Explain the role the role and responsibilities of process planning engineer.	15	BT-6	Creating

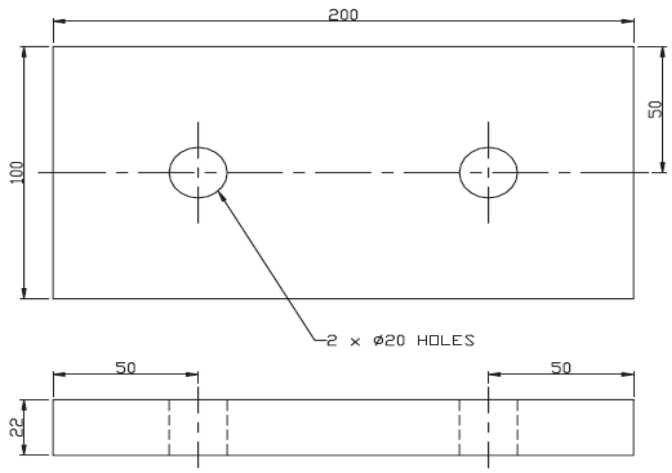
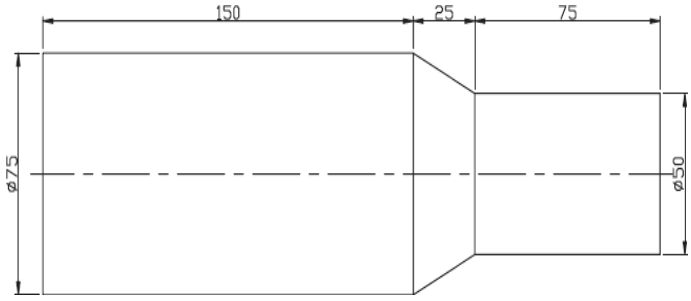
UNIT – II PROCESS PLANNING ACTIVITIES			
Process parameters calculation for various production processes-Selections of jigs and fixtures -Selection of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies			
PART-A(2Marks)			
Q.No	**Questions**	**BT Level**	**Competence**
1.	List the factors Considered for selecting Process parameter.	BT-1	Remembering
2.	Classify milling operations.	BT-2	Understanding
3.	Define cutting speed.	BT-1	Remembering
4.	Solve the general factors that will influence the design construction of a work holder.	BT-3	Applying
5.	A planer is capable of 15 strokes per minute over a stroke length of 2m. The cutting time ratio for the machine is 4:3. Determine cutting speed.	BT-1	Remembering
6.	Analyze the basic principles of jig and fixture design can be categorized	BT-4	Analyzing
7.	Infer the factors previously considered for the tooling decision are the most influential on the calculation of the process parameters.	BT-3	Applying
8.	Give the factors that are considered for depth of cut.	BT-2	Understanding
9.	Classify the three basic functions of Jig.	BT-2	Understanding
10.	What are the general recommendations for cutting depths for turning and boring?	BT-1	Remembering
11.	Show the main reasons for the use of jigs and fixtures.	BT-1	Remembering
12.	Draw the flow chart for design methodology for work holders	BT-3	Applying
13.	Categorize the main factors to be considered for work holding device.	BT-4	Analyzing
14.	Conclude the quality function for process plan.	BT-4	Analyzing
15.	Discuss how does the process planner use cost data?	BT-1	Remembering
16.	Assess the three elements of Direct cost	BT-1	Remembering
17.	Summarize major influences on the cost of materials for manufacture	BT-2	Understanding
18.	Quote the purpose of work holding Devices.	BT-1	Remembering
19.	Calculate the spindle speed required to turn a 75mm diameter shoulder on a		

	low-carbon steel component using a high-speed steel tool. What is the percentage increase in cutting speed if a carbide tool is used instead?	BT-1	Remembering
20.	Illustrate the formula to calculate the machining times for turning and boring.	BT-1	Remembering
21.	List the types of clamping devices.	BT-2	Understanding
22	Define BEQ.	BT-1	Remembering
23	List the benefits of break even quantity.	BT-2	Understanding
24	Write difference between work holding and tool holding devices.	BT-2	Understanding
25	Compare break even sales and margin.	BT-1	Remembering

PART-B (13Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Summarize the general recommendations for cutting depths for turning, boring, milling and Drilling?	13	BT-2	Understanding
2.	Describe depth of cut and what are the most important factors that affect the depth of cut possible when machining?	13	BT-1	Remembering
3.	Calculate the spindle speed required to turn a 75mm diameter shoulder on a low-carbon steel component using a high-speed steel tool. What is the percentage increase in cutting speed if a carbide tool is used instead?	13	BT-1	Remembering
4.	Consider the part shown in Fig.i This is to be machined on a milling machine in three operations as given in Table Using this information, determine:(i)suitable speeds (rpm) and feeds (mm rev-1) for each operation; (ii)the total machining time.	13	BT-2	Understanding

	 *Aluminium alloy part* Fig.i *Operations and tooling data* *Operation description* — *Tooling description* Profile sides in one pass — Ø30 mm carbide end mill with 18 teeth Finish top surface in four passes — Ø20 mm carbide face mill with 12 teeth Drill holes — Ø20 mm HSS drill *Drg. notes*: Material: aluminium alloy Workpiece: 25 mm thick Holes: 15 mm deep Fillets: R25 mm unless indicated otherwise.			
5.	Consider the component shown in Fig.ii and design a suitable type of jig for drilling the Ø10 mm holes, assuming the holes are manufactured ast  Fig.ii	13	BT-4	Analyzing
6.	The top surface of the aluminium alloy component shown in Fig.iii is to be milled by slab milling. It will be machined by a Ø20mm HSS cutter with eight cutting teeth at a constant surface			

	speed of 45m min^{-1}.The depth of cut is 4 mm and the milling machine is capable of spindle speeds of up to 3000 rpm. Determine: (i) if the mill is capable of machining the component at the required surface speed (ii) the total machining time for the component if the mill is capable.  Fig.iii	13	BT-4	Analyzing
7.	For the part shown in Fig.iv calculate the maximum surface speeds for facing, turning all surfaces and parting off. The maximum spindle speed of the lathe being used is 600rpm.  Fig.iv	13	BT-3	Applying
8.	(a) Show the seven quality control tools and techniques relate to quality improvement and problem solving? (b) Compare the process control and process capability.	7 6	BT-2	Understanding
9.	(a)Explain the typical quality characteristics are measured in quality control. (b) Compare the measuring variables and attributes.	7 6	BT-2	Understanding

10.	A large computer manufacturer requires 1200 printed circuit board (PCB) carriers every month for the production of the PCBs themselves. Within their tool room, they have a variety of machining processes.Within their tool room, they have a variety of machining processes available and the carriers are produced on a conventional milling machine. The following information relates to the PCB carrier manufacture: Set-up time =1 h 20 min Machining time =39 min Material cost/unit =Rs.5.62 Machinist's hourly rate =Rs.9.85/h	13	BT-3	Applying
11.	Formulate a case study for the standard parts of Jigs and fixtures.	13	BT-6	Creating
12.	(a) Point out the documents required for Process Planning. (b) Analyze the different factors considered in developing a manufacturing logic.	6 7	BT-4	Analyzing
13.	Connect the prime cost and how does it relate to the cost categories.	13	BT-4	Analyzing
14.	Sketch and Develop the categories of cost.	13	BT-3	Applying
15.	A power hacksaw machine was purchased for RS.25,000. After 5 years the machine was valued at Rs 10,000.find out the depreciation amount according to the sinking fund method, the rate of interest being 5%.	13	BT-4	Analyzing
16.	Explain the annuity method with suitable applications.	13	BT-4	Analyzing
17.	Find out the depreciation annuity by the annuity charging method after 4 years, when the cost of machine is Rs15,000 and the scrap value is Rs30,000 only. Take rate of interest at 5%.and also calculate the value of the machine after 2 years.	13	BT-3	Applying
18.	Describe the sum of the year's digit method used in the manufacturing industry.	13	BT-3	Applying
PART- C (15Marks)				
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**

1.	Reframe the major factors considered for selecting cutting velocity for machining operation.	15	BT-5	Evaluating
2.	Calculate the total machining time for plain milling a rectangular surface of length 100mm and width 50mm by a helical fluted plain HSS milling cutter of diameter 60mm, length 75mm and 6 teeth. Assume approach = over run = 5mm, cutting velocity = 40m/min and feed per tooth = 0.1 mm/tooth	15	BT-4	Analyzing
3.	Develop the factors to be considered in selection of process parameters.	15	BT-6	Creating
4.	Appraise the importance of selection of the right quality assurance method During manufacturing.	15	BT-5	Evaluating
5.	The original assets of company are Rs5,80,000. The life of the plant is 9 years. If the scrap value is Rs80000, Calculate the depreciation at the end of years by sum years digital method.	15	BT-5	Evaluating

UNIT III- INTRODUCTION TO COST ESTIMATION

Importance of costing and estimation –methods of costing-elements of cost estimation –Types of Estimates – Estimating procedure- Estimation labor cost, material cost- allocation of overhead charges- Calculation of depreciation cost.

PART-A(2Marks)

Q.No	Questions	BT Level	Competence
1.	Define cost accounting.	BT-1	Remembering
2.	Distinguish between cost estimation and cost accounting.	BT-2	Understanding
3.	List the types of estimates.	BT-1	Remembering
4.	Classify the sources of cost estimation?	BT-2	Understanding
5.	What is meant by “conceptual cost estimating”?	BT-1	Remembering
6.	What is the accuracy expected in conceptual cost estimates?	BT-2	Understanding
7.	Point out any two objectives of cost estimation.	BT-2	Understanding
8.	Summarize batch costing.	BT-2	Understanding
9.	Describe briefly standard data.	BT-1	Remembering
10.	Define under estimate.	BT-1	Remembering
11.	Give the uses of target cost.	BT-3	Applying
12.	Explain briefly about conceptual cost estimating	BT-1	Remembering
13.	Define contingency allowances.	BT-1	Remembering
14.	Illustrate briefly the characteristics of realistic estimates?	BT-3	Applying
15.	Classify the allowances considered in cost estimation.	BT-3	Applying
16.	Give the methods of costing.	BT-2	Understanding
17.	Transfer how the standard data is developed?	BT-3	Applying
18.	Explain briefly about depreciation?	BT-1	Remembering
19.	Define multiple cost method.	BT-1	Remembering
20.	list the causes of depreciation.	BT-2	Understanding
21.	Write the formula straight line method of depreciation.	BT-2	Understanding
22	Generalize the meaning direct material with an example.	BT-1	Remembering

23	Give any two functions of cost estimation.	BT-2	Understanding
24	Define parametric estimating.	BT-1	Remembering
25	What is meant by Bill of Materials?	BT-2	Understanding

PART-B (13 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	(a) Give the advantages of cost accounting. (b) Discuss the objectives of cost estimation.	7 6	BT-2	Understanding
2.	With suitable application examples classify costs.	13	BT-3	Applying
3.	(a) Discuss various types of estimates. (b) Explain the data requirements for cost estimation.	7 6	BT-2	Understanding
4.	(a) Describe the different methods of estimates. (b) Explain the allowances in estimation.	7 6	BT-2	Understanding
5.	Describe step by step procedure for estimating the direct material cost.	13	BT-1	Remembering
6.	Relate the various allowances to be considered in estimation of direct labour cost.	13	BT-4	Analyzing
7.	In a small factory making toys, the fixed overhead costs are Rs. 5,000 per month and the variable cost is Rs. 4 per piece. The selling price is Rs. 6 per piece. Estimate the minimum monthly production so that the factory may not suffer any loss.	13	BT-5	Evaluating
8.	Explain the various methods used in an industry for allocation of overheads with an example.	13	BT-4	Analyzing
9.	(a) Differentiate cost accounting and cost estimating. (b) Give the basic steps in cost estimation.	5 8	BT-2	Understanding
10.	Calculate prime cost, factory cost, production cost, total cost and selling price per item from the data given below for the year 2012-13. Cost of raw material in stock as on 1.4.2012- Rs 25,000 Raw material purchased-Rs40,000 Direct labour cost- Rs 14,000 Direct expense- Rs 1,000	13	BT-3	Applying

	Factory/work overheads- Rs 9,750 Administrative expenditure- Rs 6.500 Selling and distribution expenses- Rs 3,250 No. of items produced- 650 Cost of raw material in stock as on 31.03.2013- Rs15,000 Net profit of the items is 10% of the total cost of the product			
11.	Categorize the block diagram explain the relationship between various components of cost.	13	BT-4	Analyzing
12.	Describe the various allowances in estimation with suitable justification.	13	BT-1	Remembering
13.	Generalize the meaning of analytical estimating? Write its procedure, advantages, limitations and applications.	13	BT-6	Creating
14.	calculate prime cost, works/factory cost, production cost , total cost and profit from the following data for a sewing machine manufacturer Value of stock material as on 01.04.2010-Rs 26,000 Material purchase-Rs2,74,000 Wages to labour-Rs 1,20,000 Depreciation of plant and machinery-Rs8,000 Depreciation of office equipments-Rs 2,000 Rent, taxes and insurance of factory-Rs 16,000 General administrative expense - Rs3,400 Water, power and telephone bills of factory-Rs 9.600 Water, lighting and telephone bills of office-Rs 2,500 Material transportation in factory-Rs2,000 Rent of office building-Rs 2,000 Direct expenses-Rs5,000 Commission and pay of salesman-Rs 10,500 Repair and maintenance of plant-Rs 1,000 Works manager salary-Rs 30,000 Salary of office staff -Rs 60,000 Value of stocks of material as on 31.03.2011-Rs 36,000 Sale of products-Rs 6,36,000	13	BT-3	Applying
15.	(a) Summarize the various components of job estimate. (b)Explain the procedure followed for estimating the cost of an	7	BT-2	Understanding

	industrial product.	6		
16.	A factory has 15 lathes of same make and capacity and five shapers of same make and capacity. Lathe occupies 30m.sq. area while shaper occupies 15m.sq. During one calendar year factory expense for the section area are as follows: (i) Building rent and depreciation -Rs.5,000 (ii) Indirect labour and material - Rs.15,000 (iii) Insurance - Rs.2,000 (iv) Depreciation charges of lathe - Rs.5,000 (v) Depreciation charges of shapers - Rs.3,000 (vi) Power consumption for lathe - Rs.2,000 (vii) Power consumption for shapers - Rs.1,000 Evaluate the machine hour rate for lathes and shapers work for 25,000 hrs and 8,000 hrs respectively	13	BT-5	Evaluating
17.	Describe the various methods for calculation of depreciation.	13	BT-3	Applying
18.	Compare the Straight Line Depreciation Method and Diminishing Balance Method with suitable example.	13	BT-5	Evaluating
	PART- C (15 Marks)			
Q.No	**Questions**	**Marks**	**BT Level**	**Competence**
1.	Calculate the selling price per unit from the following data : Direct material cost = Rs. 8,000 Direct labour cost = 60 percent of direct material cost Direct expenses = 5 percent of direct labour cost Factory expenses = 120 percent of direct labour cost Administrative expenses = 80 percent direct labour cost Sales and distribution expenses = 10 percent of direct labour cost Profit = 8 percent of total cost No. of pieces produced = 200	15	BT-5	Evaluating

2.	Develop t h e various methods for calculating depreciation cost with an example.	15	BT-6	Creating
3.	Explain the various methods to find the break-even point and break-even quantity.	15	BT-6	Creating
4.	In a factory fixed overhead charges are Rs. 45,000 and the variable overhead charges are Rs. 2.50 per article. The factory is producing 45,000 articles per month under normal conditions. Find : (i) Overhead cost per article under normal conditions. (ii) If the production drops to 80 percent, calculate the charges that remain uncovered. (iii) If the production increases to 125 percent, by what amount these charges will be over recovered. Take the overhead rate per article the same as during normal production, in both the cases.	15	BT-5	Evaluating
5.	Data collected at a certain period show that for the manufacturing of a product, the labour cost Rs. 400,the ratio of direct material cost, direct labour cost and direct expenses are 1:3:2. If the factory overheads are Rs.200, administrative overheads are 20% of factory cost, selling and distribution overheads are 10% factory cost and profit required is 30% of the factory, what should be the selling price.	15	BT-5	Evaluating

UNIT IV PRODUCTION COST ESTIMATION			
Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop.			
PART-A(2Marks)			
Q.No	**Questions**	**BT Level**	**Competence**
1.	What is meant by production cost.	BT-2	Understanding
2.	How do you estimate the time required for forging?	BT-2	Understanding
3.	Explain the actual welding costs involved in estimation in welding shop?	BT-1	Remembering
4.	List the losses to be considered in estimating the gross weight of a forging component.	BT-1	Remembering
5.	Write the different sections in forging shop.	BT-1	Remembering
6.	What meant by welding.	BT-2	Understanding
7.	Write the difference between gas and arc welding.	BT-1	Remembering
8.	Recommend the costs to be considered for estimating electric welding cost of a product?	BT-5	Evaluating
9.	Illustrate how to estimate the gas cutting costs	BT-1	Remembering
10.	Give the losses in forging process.	BT-2	Understanding
11.	List the various sections that will be normally found in a foundry shop.	BT-1	Remembering
12.	List the various elements of cost involved in the total cost of Manufacturing a casting.	BT-1	Remembering
13.	Explain overhead expenses.	BT-1	Remembering
14.	Explain how cost estimation is done in respect of a welded component or welding job.	BT-1	Remembering
15.	List the various elements of cost involved in weldment or a welded component.	BT-1	Remembering
16.	Solve the various costs involved in the calculation of total cost of forged components.	BT-3	Applying
17.	Reframe the pattern making and fettling in foundry.	BT-6	Creating
18.	Differentiate leftward and rightward welding?	BT-2	Understanding
19.	List the types of forging processes.	BT-1	Remembering
20.	What is meant by machine forging?	BT-1	Remembering
21.	Define press forging.	BT-1	Remembering
22.	Generalize the meaning of tonghold loss in forging?	BT-2	Understanding

23.	Summarize the sprue loss.	BT-2	Understanding
24.	Give the formula for calculating the cost of power consumed in arc welding.	BT-2	Understanding
25.	Compare hot and cold rolling.	BT-3	Applying

PART-B (13 Marks)

Q.No	Questions	Marks	BT Level	Competence
1.	Calculate the total cost of CI (Cast Iron) cap shown in Fig.i from the following data : Cost of molten iron at cupola spout = Rs. 30 per kg Process scrap= 17 percent of net wt. of casting Process scrap return value= Rs. 5 per kg Administrative overhead charges= Rs. 2 per kg of metal poured. Density of material used= 7.2 gms/cc.	13	BT-3	Applying

Process	Time per piece	Labour charges per hr	Shop overheads per hr
Moulding and pouring	10 min	Rs. 30	Rs. 30
Casting removal, gate cutting etc	4 min	Rs. 10	Rs. 30
Fettling and inspection	6 min	Rs. 10	Rs. 30

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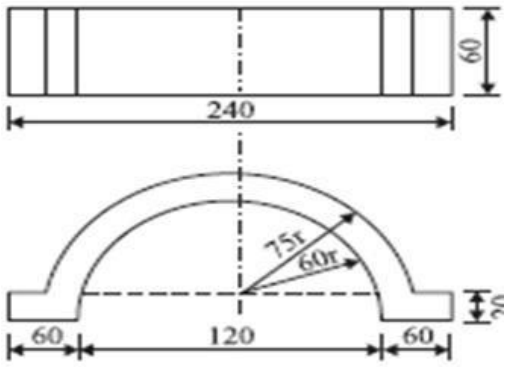
<td> 

Fig.i</td>
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<td>2.</td>
<td>Explain the estimate procedure for the material cost involved in the manufacturing a casting.</td>
<td>13</td>
<td>BT-3</td>
<td>Applying</td>
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<tr>
<td>3.</td>
<td>A cast iron component is to be manufactured as per Fig.ii Estimate the selling price per piece from the following data :
Density of material = 7.2 gms/cc
Cost of molten metal at cupola spout = Rs. 20 per kg
Process scrap= 20 percent of net weight
Scrap return value= Rs. 6 per kg
Administrative overheads= Rs. 30 per hour
Sales overheads= 20 percent of factory cost
Profit= 20 percent of factory cost
Other expenditures are:
<table>
<tr><th>Operation</th><th>Time (min)</th><th>Labour cost/hr (Rs.)</th><th>Shop overheads/hr (Rs.)</th></tr>
<tr><td>Moulding and pouring</td><td>15</td><td>20</td><td>60</td></tr>
<tr><td>Shot blasting</td><td>5</td><td>10</td><td>40</td></tr>
<tr><td>Fettling</td><td>6</td><td>10</td><td>40</td></tr>
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The component shown is obtained after machining the casting. The pattern which costs Rs. 5,000 can produce 1,000 pieces before being scrapped. The machining allowance is to be taken as 2 mm on each side</td>
<td>13</td>
<td>BT-4</td>
<td>Analyzing</td>
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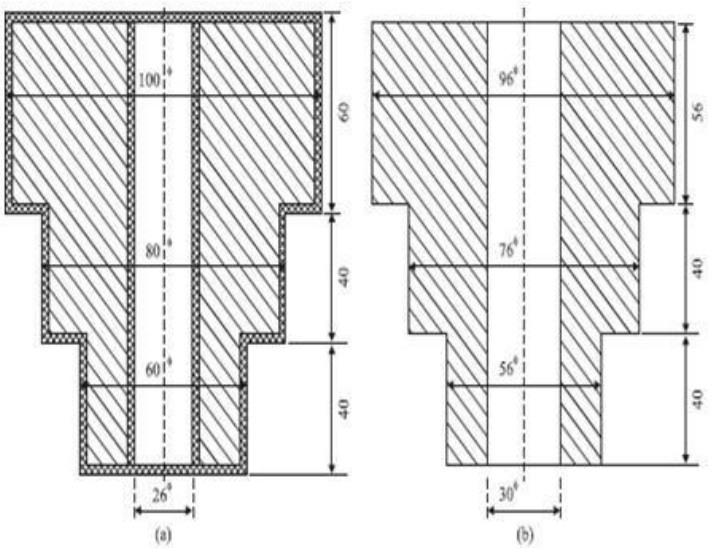
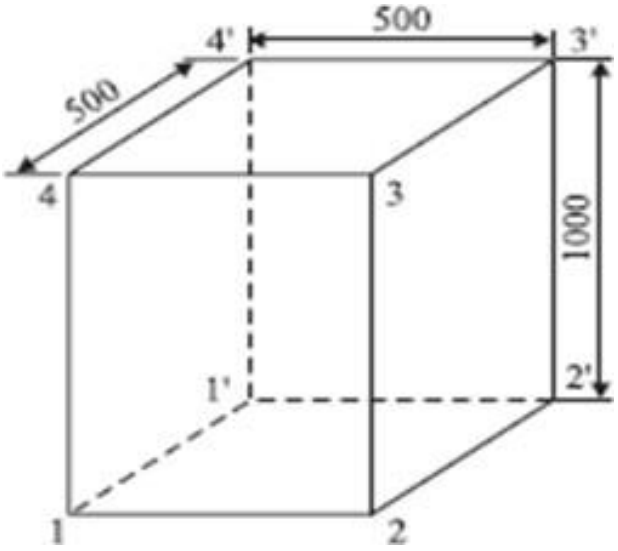
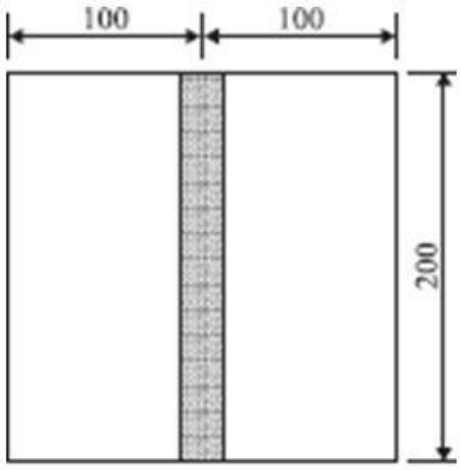
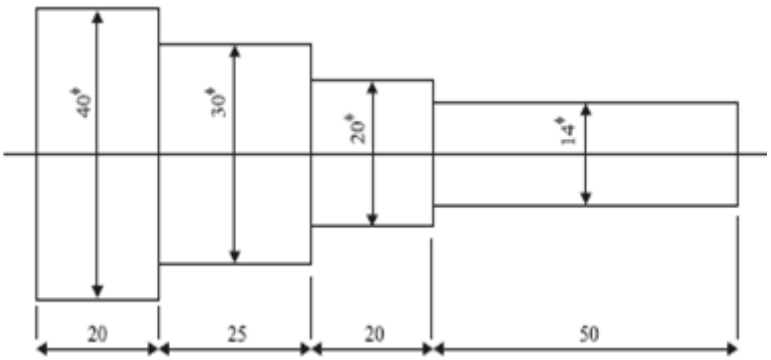
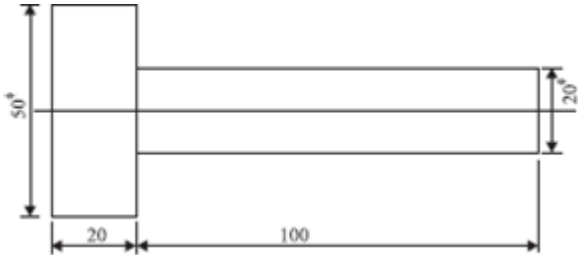
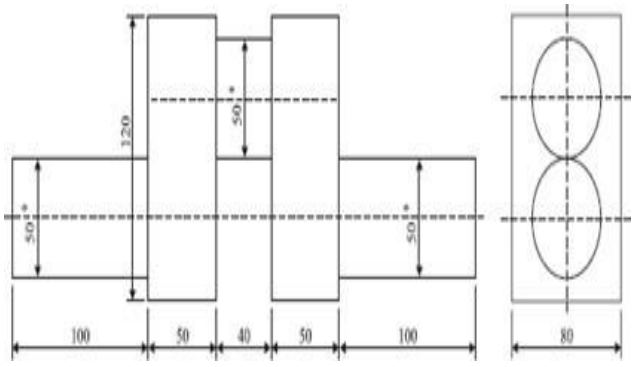
	 Fig.ii			
4.	A lap welded joint is to be made as shown in Fig.iii Estimate the cost of weld from the following data : Thickness of plate= 10 mm Electrode diameter= 6 mm Minimum arc voltage= 30 Volts Current used= 250 Amperes Welding speed= 10 meters/hour Electrode used per meter of weld= 0.350 kgs Labour rate= Rs. 40 per hour Power rate= Rs. 3 per kWh Electrode rate= Rs. 8.00 per kg Efficiency of welding m/c= 50 percent Connecting ratio= 0.4 Overhead charges = 80 percent of direct charges Labour accomplishment factor = 60 percent  Fig.iii	13	BT-4	Analyzing
5.	Calculate the welding cost from the following data : Plate thickness = 12 mm Form of joint = 60° V Root gap = 2 mm	13	BT-3	Applying

	Length of joint = 2 meters Electrode diameters = 3.5 mm and 4.0 mm Electrode length = 350 mm Electrodes required per meter weld= 10 nos. of 3.5 mm dia and for 100per cent efficiency and 24 nos. Of 4 mm dia50 mm stub length. Average deposition h= 80 percent Melting time per electrode = 1.3 minutes for 3.5 mm dia Melting time per electrode = 1.50mins for 4 mm dia electrode Connecting ratio= 2 Hourly welding rate= Rs. 40 Overhead charges= 40 percent of welding cost.			
6.	Evaluate the welding cost for a cylindrical boiler drum 2.5 m × 1 m diameter which is to be made from 15 mm thick M.S. plates. Both the ends are closed by arc welding of circular plates to the drum. Cylindrical portion is welded along the longitudinal seam and welding is done both in inner and outer sides. Assume the following data: (i) Rate of welding = 2 meters/ hour on inner side and 2.5 meters per hour on outer side (ii) Length of electrodes required = 1.5 m/ meter of weld length (iii) Cost of electrode = Rs. 0.60 per meter (iv) Power consumption= 4 kWh/meter of weld (v) Power charges= Rs. 3/kWh (vi) Labour charges= Rs. 40/hour (vii) Other overheads= 200 percent of prime cost (viii) Discarded electrodes = 5 percent (ix) Fatigue and setting up time= 6 % of welding time.	13	BT-4	Analyzing
7.	A container open on one side of size 0.5 m × 0.5 m × 1 m is to be fabricated from 6 mm thick plates Fig.iv. The plate metal weighs 8 gms/cc. If the joints are to be welded, make calculations for the cost of container. The relevant data is: Cost of plate= Rs. 10 per kg Sheet metal scarp (wastage) = 5 percent of material Cost of labour = 10 percent of sheet metal cost			

	Cost of welding material= Rs. 20 per meter of weld.  Fig.iv	13	BT-3	Applying
8.	Estimate the cost of welding two pieces of mild steel sheets 1 meter long and 7 mm thick. A 60° V is prepared by means of gas cutting before welding is to the commenced. The cost of Oxygen is Rs. 7/cu meter and of acetylene is Rs. 4/cu meter. The filler metal costs Rs. 20 per kg. The following data is also available: For gas cutting (For 10 mm thick plate) Cutting speed= 20 m/hr Consumption of Oxygen= 2 cu meter/hr Consumption of acetylene= 0.2 cu meter/hr Data for Rightward Welding (For 7 mm thick plate) Consumption of Oxygen= 0.8 cu meter/hr Consumption of acetylene= 0.8 cu meter/hr Dia of filler rod used= 3.5 mm Filler rod used per meter of weld= 3.4 meters Rate of welding= 3 meters/hr Density of filler metal= 8 gm/cc	13	BT-3	Applying
9.	Calculate the cost of welding two plates 200 mm × 100 mm × 8 mm thick to obtain a piece 200 mm × 200 mm × 8 mm approximately using rightward welding technique Fig.v The	13	BT-5	Evaluating

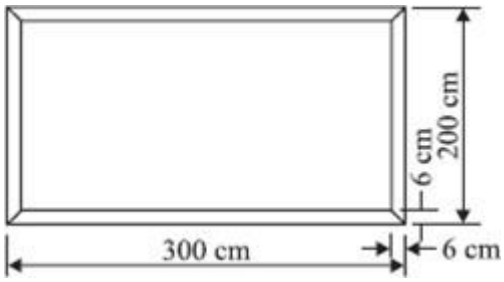
	following data is available: Cost of filler material= Rs. 60 per kg Cost of oxygen= Rs. 700 per 100 cumeters Cost of acetylene= Rs. 700 per 100 cumeters Consumption of oxygen= 0.70 cu m/hr Consumption of acetylene= 0.70 cu m/hr Diameter of filler rod= 4 mm Density of filler material= 7.2 gms/cc . Filler rod per meter of weld= 340 cms Speed of welding= 2.4 meter/hr Labour is paid Rs. 20 per hour. overheads may be taken as100 percent of labour cost.  Fig.v			
10.	Calculate the net weight and gross weight for the component shown in Fig.vi Density of material used is 7.86 gm/cc.  Fig.vi calculate (i) Length of 14 mm dia bar required to forge one component. (ii) Cost of forging/piece if:	13	BT-3	Applying

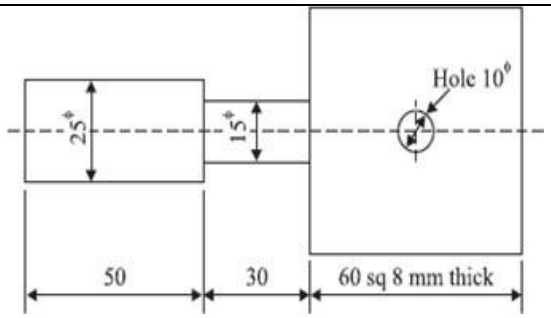
	Material cost = Rs. 80 per kg Labour cost = Rs. 5 per piece Overheads = 150 percent of labour cost			
11.	150 components, as shown in Fig.vii are to be made by upsetting of 20 mm bar. Estimate the net weight, gross weight and length of f 20 mm bar required. The density of material may be taken as 7.86 gms/cc.  Fig.vii	13	BT-5	Evaluating
12.	Analyze the cost of forging a crank shaft as shown in Fig.viii. The forging is to be made out of a bar stock of 50 mm f and following data is available: (i) Material price = Rs. 80 per kg (ii) Direct labour charges = Rs. 23 per piece (iii) Overhead charges = 150 percent of material cost (iv) Density of material = 7.5 gms/cc (v) Losses = 28 percent of net weight  Fig.viii	13	BT-4	Analyzing
13.	Describe the direct material cost and direct other expenses in costing of welded joint.	13	BT-4	Analyzing
14.	A foundry unit produces tractor components as cast. Analyze the selling price of a component weighing 50 kgs from the following data :	13	BT-4	Analyzing

	Material of component is cast iron with density=7.2 gms/cc Cost of molten iron at cupola= Rs. 2.50 per kg Process scrap= 17 percent of net weight Scrap return value= Rs. 1.10 per kg Administrative and sales overheads= Rs. 5 per casting Agents commission= 5 percent of sales price Profit = 10 percent of total cost Other expenditure is given in table below: *Operation* | *Time per component (minutes)* | *Labour cost component (Rs.)* | *Shop overheads per hour (Rs.)* Moulding and pattern making | 6 | 0.90 | 3.00 Core making | 8 | 0.80 | 4.00 Fettling and cleaning | 10 | 1.00 | 8.00			
15.	List the various elements considered while calculating the cost of a welded joint.	13	BT-3	Applying
16.	What are the various losses considered while calculating the material cost for a forged component? Explain.	13	BT-2	Understanding
17.	Discuss the various constituents of cost of a forged component and Determine the cost of filler material and gases consumed in welding of two plates 8 mm thick and 1.5 m long. Gas cutting is used to make 60°-V on the edges of both the plates. The cost of Oxygen is Rs. 10 per cu meter and cost of acetylene is Rs. 5 per cu meter. The filler rod costs Rs. 6.50/kg. Take other data from the tables. Density of filler metal is 10 gms/cc.	13	BT-3	Applying
18.	Discuss the various constituents of cost of a forged component.	13	BT-3	Applying

PART- C (15Marks)

Q.No	Questions	Marks	BT Level	Competence
1	Evaluate the cost of welding of two plates 100 × 100 × 8 mm thick to obtain a plate of dimensions 200 ×100 × 8 mm. The following data is available: (i) Welding is done on both the sides (ii) Electrode diameter= 5 mm (iii) Electrode used per meter of weld= 0.500 kg (iv) Minimum arc voltage= 30 Volts			

	(v) Current used= 225 Amperes (vi) Labour charges= Rs. 10/m of weld (vii) Electrode price= Rs. 10/kg (viii) Efficiency of welding machine= 50 percent (ix) Welding speed= 2 meters/hour (x) Ratio of operating to connecting time= 1.5	15	BT - 5	Evaluating
2	A rectangular frame shown in Fig. ix is to be made using plates of 300 cm × 6 cm × 4 mm and 200 cm × 6 cm × 4 mm sizes. Analyze the cost of filler metal and gases used to make 100 frames. The following data is available for leftward welding: (i) Dia of filler rod= 3.00 mm (ii) Filler rod used per meter of weld= 2.10 meters (iii) Density of filler rod material= 11 gms/cc (iv) Consumption of Oxygen/hour= 0.20 cu meter (v) Consumption of acetylene per hour= 0.20 cu meter (vi) Welding speed= 4.6 metres/hour (vii) Cost of Oxygen= Rs. 80/100 cu meter (viii) Cost of acetylene= Rs. 500/100 cu meter Welding is to be done on both sides of the frame.  Fig. ix	15	BT-4	Analyzing
3	Estimate the net weight and gross weight for the manufacture of 500 levers shown in Fig. x. The material weighs 7.8 gms/cc and the total losses account for 25 percent of net weight of the lever. Also calculate: i) Length of 3 cm diameter rod required/component. ii) The cost of forging 500 pieces if the material costs Rs. 80 perkg, labour cost is Rs. 5per piece and overheads are 25 percent of material cost.	15	BT-5	Evaluating

	 Fig.x			
4	(i) Evaluate the various losses considered while calculating the material cost for a forged component? Describe the various constituents of cost of a forged component. (i) Evaluate the cost of filler material and gases consumed in welding of two plates 8 mm thick and 1.5 m long. Gas cutting is used to make 60°- V on the edges of both the plates. The cost of Oxygen is Rs. 10 per cu meter and cost of acetylene is Rs. 5 per cu meter. The filler rod costs Rs. 6.50/kg. Take other data from the tables. Density of filler metal is 10 gms/cc.	8 7	BT - 5	Evaluating
5	Explain the following : (a) Distribution of die cost on individual components. (b) Material cost in costing of cast products. (c) Process scarp in a casting process.	15	BT - 5	Evaluating

UNIT-V MACHINING TIME CALCULATION

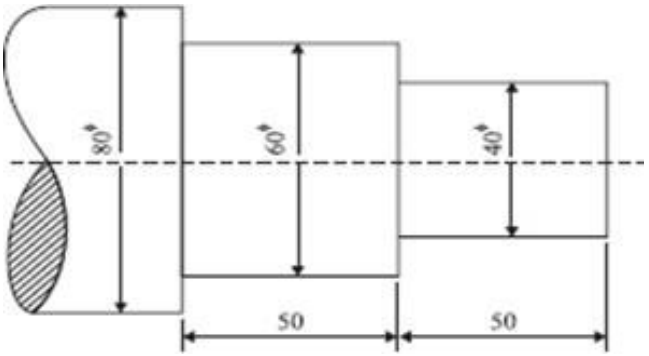
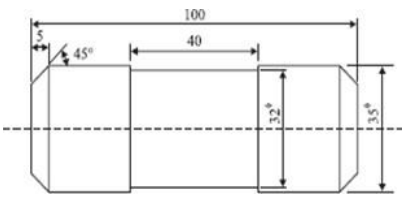
Estimation of Machining Time - Importance of Machine Time Calculation- Calculation of Machining Time for Different Lathe Operations, Drilling and Boring - Machining Time Calculation for Milling, Shaping and Planning -Machining Time Calculation for Grinding.

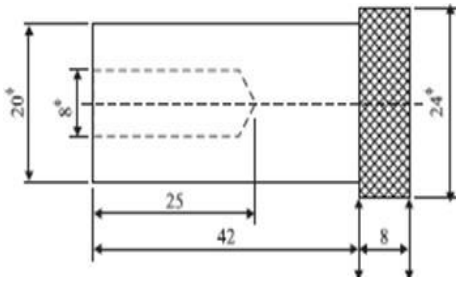
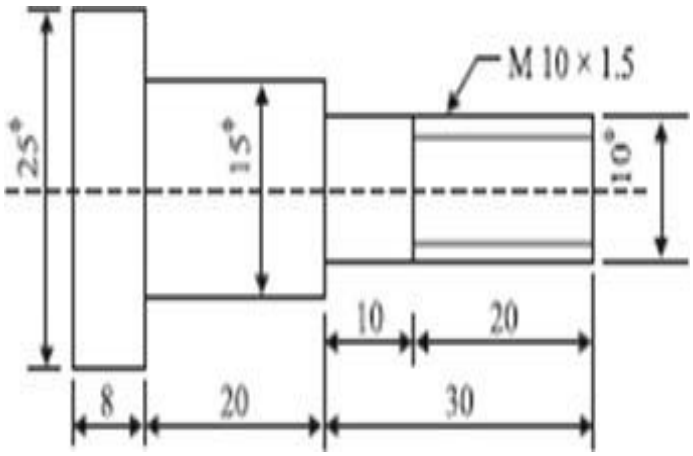
PART-A(2Marks)

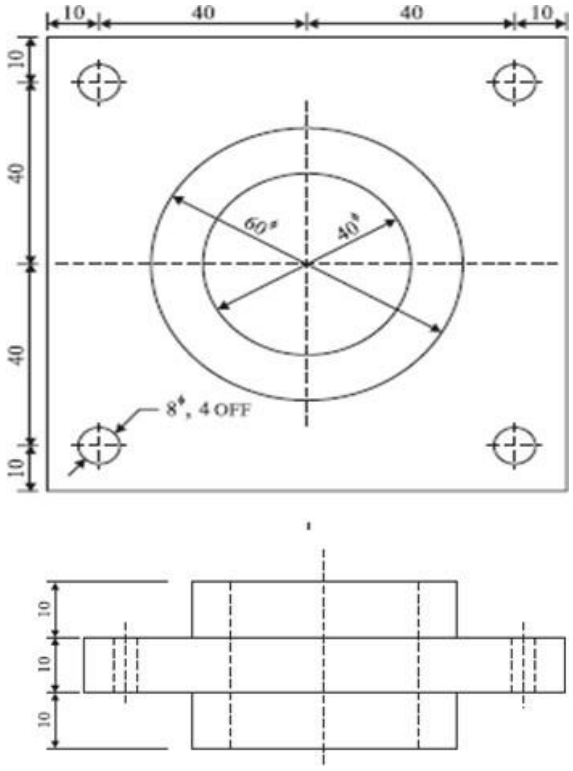
Q.No	Questions	BT Level	Competence
1.	Define cycle time.	BT-1	Remembering
2.	List various factors affecting cutting speed.	BT-1	Remembering
3.	Write formula to calculate the time required for drilling a hole in an object.	BT-2	Understanding
4.	Estimate the milling time to cut 60 teeth on a gear blank 60 mm thick; feed 35 mm/min and take overall set up time as 10 minutes.	BT-2	Understanding
5.	Calculate the time required for turning operation.	BT-3	Applying
6.	List the major objectives in machining industries?	BT-1	Remembering
7.	Discuss briefly about the necessities to determine the actual machining time?	BT-1	Remembering
8.	List the major factors to be considered for selecting cutting velocity for machining operations?	BT-1	Remembering
9.	List the major factors to be considered for selecting value of feed for machining operations?	BT-1	Remembering
10.	Differentiate length of cut and depth of cut.	BT-2	Understanding
11.	Define machining time.	BT-1	Remembering
12.	Explain briefly the types of machining processes in the machine shop.	BT-1	Remembering
13.	Sketch the spot facing process.	BT-3	Applying
14.	Define approach length.	BT-1	Remembering
15.	What meant by over travel.	BT-2	Understanding
16.	Define boring process.	BT-1	Remembering
17.	Give the formula for estimation of machining time for drilling.	BT-2	Understanding
18.	Differentiate planer and shaper	BT-2	Understanding
19.	Give the types of grinding machine	BT-2	Understanding
20.	Define Set-up time	BT-1	Remembering

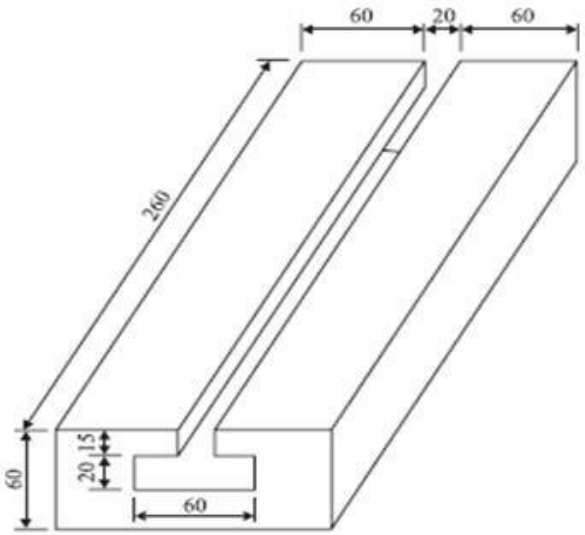
21.	What is meant by tool changing allowance?	BT-1	Remembering
22	Classify the milling operations.	BT-1	Remembering
23	What is meant by reaming process?	BT-2	Understanding
24	Differentiate between the horizontal and vertical milling.	BT-2	Understanding
25	Explain briefly about handling time in machining.	BT-1	Remembering

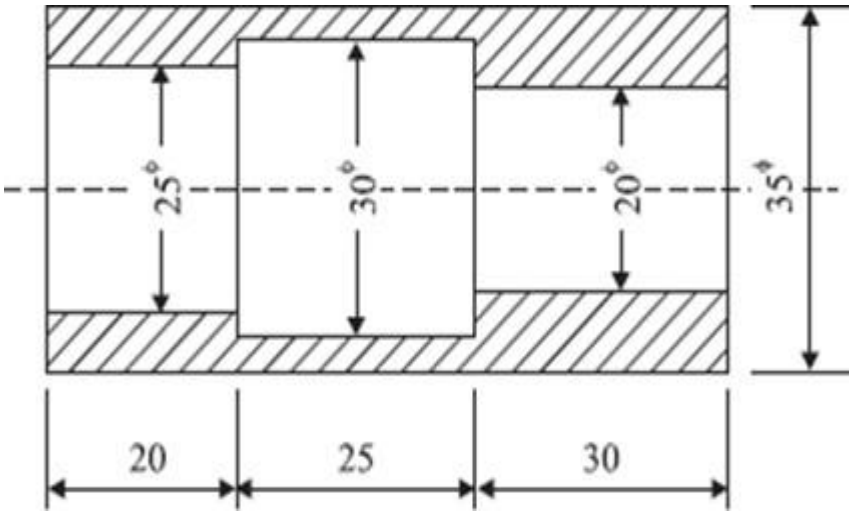
PART-B (13 Marks)

Q. No	Questions	Marks	BT Level	Competence
1.	Calculate the machining time to turn the dimensions shown in Fig.i. Starting from a M.S. bar off 80 mm. The cutting speed with HSS tool is 60 meters per minute and feed is 0.70 mm/rev., depth of cut is 2.5 mm per pass.  Fig i	13	BT-3	Applying
2.	A mild steel bar 100 mm long and 38 mm in diameter is turned to 35 mm dia. And was again turned to a diameter of 32 mm over a length of 40 mm as shown in the Fig.ii. The bar was machined at both the ends to give a chamfer of 45° × 5 mm after facing. Calculate the machining time. Assume cutting speed of 60 m/min and feed 0.4 mm/rev. The depth of cut is not to exceed 3 mm in any operation.  Fig .ii	13	BT-3	Applying

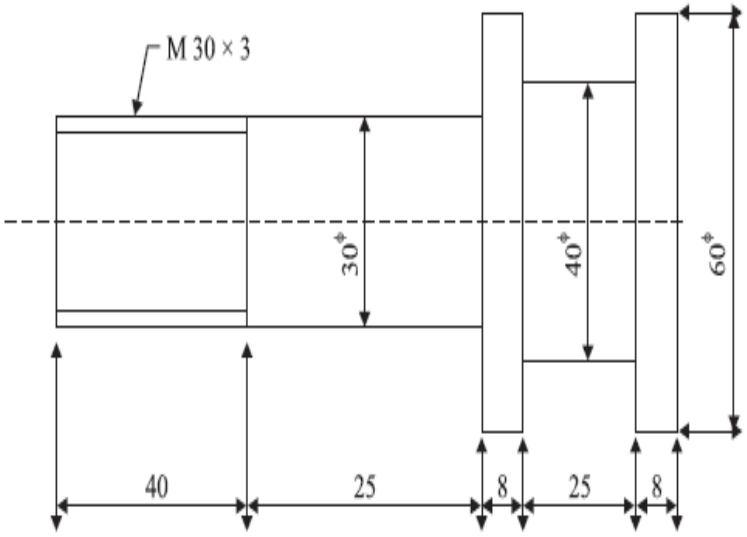
3.	A mild steel shaft, shown in Fig.iii is to be turned from a 24 mm dia bar.  Fig .iii The complete machining consists of the following steps : (i) Facing 24 mm on both sides (ii) Turning to 20 mm (iii) Drilling 8 mm hole (iv) Knurling With H.S.S tool the cutting speed is 60 m/min. The feed for longitudinal machining is 0.3 mm/rev. The feed for facing, 0.2 mm/rev., feed for knurling 0.3 mm/rev., and feed for drilling is 0.08 mm/rev. Depth of cut should not exceed 2.5 mm in any operation. Evaluate the machining time to finish the job.	13	BT-3	Applying
4.	Estimate the machining time required to produce one piece of the component shown in Fig. iv starting from 25 mm bar. The following data is available.  Fig.iv For turning: Cutting speed = 40 m/min. Feed = 0.4 mm/rev. Depth of cut = 2.5 mm/per pass	13	BT-5	Evaluating

	For thread cutting: Cutting speed = 8 m/min.			
5.	Estimate the time taken to drill a 25 mm dia × 10 cm deep hole in a casting. First a 10 mm dia drill is used and then the hole is enlarged by a 25 mm dia drill. Assume: Cutting speed= 15 m/min. Feed for 10 mm drill= 0.22 mm/rev. Feed for 25 mm drill= 0.35 mm/rev.	13	BT-5	Evaluating
6.	Estimate the machining time to drill four 8 mm dia holes and one 40 mmdia central hole in the flange shown in Fig. v. 20 mm dia hole is drilled first and then enlarged to 40 mm f hole. Take cutting speed 10 m/min, feed for 8 mm drill 0.1 mm/rev, for 20 mm drill feed is 0.2 mm/rev. and for 40 mm of drill feed is 0.4 mm/rev.  Fig .v	13	BT-4	Analyzing
7.	(a) Analyse the time required to tap a hole with 25 mm dia tap to a length of 30 mm having 3 threads per cm. The cutting speed is 10 m/min. For return stroke the speed is 2 times the cutting speed. (b) A 300 mm × 50 mm rectangular cast iron piece is to be face milled with a carbide cutter. The cutting speed and feed are 50 m/min and 50 mm/min. If the cutter dia is 80 mm and it has 12	6	BT-3	Applying

	cutting teeth, calculate: (i) Cutter r.p.m. (ii) Feed per tooth (iii) Milling time	7		
8.	A T-slot is to be cut in a C.I. slab as shown in Fig. vi. Analyse the machining time. Take cutting speed 25 m/min, feed is 0.25 mm/rev. Dia of cutter for channel milling is 80 mm.  Fig .vi	13	BT - 4	Analyzing
9.	Analyse the time required to manufacture the tapered cylindrical job of dimensions; minor diameter 30 mm, major diameter 80 mm and length 120 mm from a given round bar of 80 mm diameter and 120 mm length. Assume: Cutting speed = 75 m/min. Max. feed by compound rest = 0.05 mm/rev Depth of cut should not exceed 4 mm.	13	BT-4	Analyzing
10.	Examine the planning time for a casting 1.25 m long and 0.5 m wide which is machined on a planer having cutting speed of 12 m/min and a return speed of 30 m/min. Two cuts are required, one roughing with a depth of 3.125 mm and a feed of 0.1 mm/rev and other finishing with a depth of 0.125 mm and using a feed of 0.125 mm.	13	BT-4	Analyzing
11.	Estimate the time taken to prepare a job as shown in Fig.vii from M.S (Mild Steel) stock bar 4 cm in diameter and 7.5 cm long. Assume the following data:			

	Cutting speed for turning and boring operation = 20 m/min. Cutting speed for drilling operation= 30 m/min. Feed for turning and boring operation= 0.2 mm/rev. Feed for 20 mm drill = 0.23 mm/rev. Depth of cut not to exceed 3 mm in any operation  Fig.vii	13	BT-2	Understanding
12.	A 3 cm deep slot is to be milled with a 8 cm diameter cutter. The length of the slot is 30 cm. What will be the total table travel to complete the cut? If the cutting speed is 20 metres/min and feed per tooth is 0.2 mm, examine the milling time. The cutter has 24 teeth and one cut is sufficient for the slot.	13	BT-4	Analyzing
13.	A 15 cm long M.S bar is to be turned from 4 cm dia in single cut in such a way that for 5 cm length its dia is reduced to 3.8 cm and remaining 10 cm length is reduced to 3.4 cm. Estimate the total time required for turning it assuming cutting speed as 30 m/min., feed as 0.02 cm/revolution and time required for setting and mounting of the job in a three jaw chuck is 30 sec. Neglect the tool setting time. Examine the time required for knurling 5 cm length at 20 m/min and feed 0.03 cm/rev.?	13	BT-4	Analyzing
14.	A 20 cm × 5 cm C.I. surface is to be faced on milling machine with a cutter having a dia of 10 cm and 16 teeth. If the cutting speed and feed are 50 m/min and 5 cm/min respectively, examine the milling time, r.p.m. of the cutter and feed per tooth.	13	BT-5	Evaluating
15.	Find the time required on a shaper to machine a plate 600 mm × 1,200 mm, if the cutting speed is 15 meters/min. The ratio of return stroke time to cutting time is 2 : 3. The clearance at each end is 25	13	BT-4	Analyzing

	mm along the length and 15 mm on width. Two cuts are required, one roughing cut with cross feed of 2 mm per stroke and one finishing cut with feed of 1 mm per stroke.			
16.	Estimate the time required to rough grind a mild steel rod 200 mm long from 28.3 mm dia to 28 mm dia. Width of grinding wheel is 40 mm and job surface speed is 3 meters per minute and depth of cut is 0.1 mm. The longitudinal feed is to be half the wheel width per revolution of work piece.	13	BT-5	Evaluating
17.	Explain the following terms with respect to machining operations giving examples : (a) Set-up time. (b) Handling time. (c) Unit operation time. (d) Total time.	13	BT-4	Analyzing
18.	What are the various allowances to be considered while calculating the total time for manufacturing a component?	13	BT-5	Evaluating
	PART- C (15 Marks)			
Q. No	**Questions**	**Marks**	**BT Level**	**Competence**
1.	Estimate the time required on a shaper to machine a plate 600 mm × 1,200 mm, if the cutting speed is 15 meters/min. The ratio of return stroke time to cutting time is 2 : 3. The clearance at each end is 25 mm along the length and 15 mm on width. Two cuts are required, one roughing cut with cross feed of 2 mm per stroke and one finishing cut with feed of 1 mm per stroke.	15	BT-4	Analyzing
2.	Mild steel shaft 30 cm long is to be rough ground from 43.3 mm dia to 43 mm dia using a grinding wheel of 40 mm face width. Calculate the time required to grind the job assuming work speed of 12 m/min and depth of cut 0.02 mm per pass.	15	BT-5	Evaluating
3.	(i) Estimate the time required on a shaper to machine a plate 600 mm × 1,200 mm, if the cutting speed is 10 meters/min. The ratio of return stroke time to cutting time is 3: 4. The clearance at each end is 30 mm along the length and 20 mm on width. Two cuts are required, one roughing cut with cross feed of 2.5 mm per stroke and		BT-5	Evaluating

	one finishing cut with feed of 1.5 mm per stroke. (ii) Mild steel shaft 60 cm long is to be rough ground from 45 mm dia to 42 mm dia using a grinding wheel of 40 mm face width. Evaluate the time required to grind the job assuming work speed of 15 m/min an depth of cut 0.04mm per pass.	8 7		
4.	Calculate the machining time for the manufacture of pins shown in Fig.viii Assume the following data : Cutting speed for turning = 22 meters/min Feed rate for turning = 0.8 mm/revolution Depth of cut not to exceed = 3 mm Cutting speed for threading = 6 meter/min.  Fig.viii	15	BT-6	Creating
5.	A face milling cutter of 150 mm diameter is used to give a cut on a m.s. block 500 mm × 250 mm. The cutting speed is 16 m/min and feed 0.2 mm/revolution. Calculate the time required to complete one cut.	15	BT-5	Evaluating